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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/811,899	03/30/2004	Shinichi Takahashi	50943-025	1321

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EXAMINER	
LEWIS, BEN	

ART UNIT	PAPER NUMBER
1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/811,899	TAKAHASHI, SHINICHI	
	Examiner	Art Unit	
	Ben Lewis	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *Amendment filed 7/29/08*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

1. The Applicant's amendment filed on July 29th, 2008 was received. Claim 10 was amended.

2. The text of those sections of Title 35, U.S.C. code not included in this action can be found in the prior Office Action (issued on April 29th, 2008).

Claim Rejections - 35 USC § 103

3. Claims 1-7,10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reiser et al. (US 2004/0001982 A1) in view of Kindler et al. (US 6,440,594 B1).

With respect to claims 1,3,4,7, Reiser et al. teach a fuel cell system comprising a cathode (74), an anode (72) and a polymer electrolyte membrane (70), a fuel gas passage (94), an air passage (92), a separator (84), and a pure water channel (96), which allows the pure water to pass into the separator. Furthermore, Reiser et al. teach the needs to make the separators (water transport plates, 84,86,88,89) become hydrophilic. See Paragraphs 23,27, Figure 1. However, Reiser et al. do not teach the pure water channel including polymers respectively having polymer chains.

Kindler et al. teach a fuel cell where each membrane electrode assembly is sandwiched between a pair of flow-modifying plates which comprise biplates and

endplates respectively (column 14, lines 5.9-61). Kindler et al. disclose that each biplate is a two-sided separator that prevents contact between the anode and the cathode of the fuel cell. Kindler et al. further disclose that the biplates of the fuel cells are provided with a hydrophilic surface (column 16, lines 35-37); an example of a hydrophilic material that can be applied to the surface of the biplate is N-isopropyl acrylamide (column 16, lines 43-53). By attaching a polymer as the hydrophilic material to the surface of the water channels on the biplates, the fuel cell inherently has a structure wherein polymer chains that form an entanglement among themselves since N-isopropyl acrylamide is the same hydrophobic polymer used by the applicant in the instant invention. Kindler et al. teach the hydrophilic treatment have the desirable property of discouraging droplet formation, and allowing the formation of a sheet of water which is more easily drained by gravity. See Column 16, Lines 32-42. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include polymers having a polymer chains on the surface of water channels of Reiser et al., because Kindler et al. teach the use of hydrophilic treatment to facilitate the flow of the water.

With regards to claims 2 and 10, it is inherent that when the fuel cell is operating, water will flow through the water channels (reactant flow channels) which would breakup the polymer entanglement coated therein and that when the fuel ceil is not operating, some water will remain in the water channels and the water will be held in the N-isopropyl acrylamide in the biplate. When the fuel cell operation is stopped, the reactant gas flow in the flow channels, is also stopped such that the water flowing through the reactant

flow channel would also stop. Alternatively, with respect to Claim 2, the method of operating the apparatus is not given patentable weight in an apparatus claim; the manner of operating the device does not differentiate apparatus claim from the prior art (see MPEP 2114).

With respect to claims 5,6, Kindler et al. teach the use of N-isopropyl acrylamide, which is inherently a thermo-responsive polymer that undergoes volume phase transition in accordance with the temperature of water and that the polymer contracts at temperatures of 40°C or higher and expands at temperature of 20°C or lower.

4. Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reiser et al. (US 2004/0001982 A1) in view of) in view of Kindler et al. (US 6,440,594 B1) and further in view of Kanno et al. (US 2003/0017375 A1).

Reiser et al. teach a fuel cell system comprising a cathode (74), an anode (72) and a polymer electrolyte membrane (70), a fuel gas passage (94), an air passage (92), a separator (84), and a pure water channel (96), which allows the pure water to pass into the separator. Furthermore, Reiser et al. teach the needs to make the separators (water transport plates, 84,86,88,89) become hydrophilic. See Paragraphs 23,27, Figure 1. However, Reiser et al. do not teach the pure water channel including polymers respectively having polymer chains.

Kindler et al. teach a fuel cell where each membrane electrode assembly is sandwiched between a pair of flow-modifying plates which comprise biplates and

endplates respectively (column 14, lines 5.9-61). Kindler et al. disclose that each biplate is a two-sided separator that prevents contact between the anode and the cathode of the fuel cell. Kindler et al. further disclose that the biplates of the fuel cells are provided with a hydrophilic surface (column 16, lines 35-37); an example of a hydrophilic material that can be applied to the surface of the biplate is N-isopropyl acrylamide (column 16, lines 43-53). By attaching a polymer as the hydrophilic material to the surface of the water channels on the biplates, the fuel cell inherently has a structure wherein polymer chains that form an entanglement among themselves since N-isopropyl acrylamide is the same hydrophobic polymer used by the applicant in the instant invention. Kindler et al. teach the hydrophilic treatment have the desirable property of discouraging droplet formation, and allowing the formation of a sheet of water which is more easily drained by gravity. See Column 16, Lines 32-42. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include polymers having a polymer chains on the surface of water channels of Reiser et al., because Kindler et al. teach the use of hydrophilic treatment to facilitate the flow of the water.
Reiser et al. as modified by Kindler et al. a teach a fuel cell system comprising a cathode (74), an anode (72) and a polymer electrolyte membrane (70), a fuel gas passage (94), an air passage (92), a separator (84), and a pure water channel (96), which allows the pure water to pass into the separator.

Furthermore, Reiser et al. as modified by Kindler et al. teach the needs to make the separators (water transport plates, 84,86,88,89) become hydrophilic. See Paragraphs 23,27, Figure 1. However, Reiser et al. as modified by Kindler et al. do not

teach the means for discharging the pure water in the pure water channel when the fuel cell is shut down.

Kanno discloses a fuel cell system that prevents water from freezing in a fuel cell when the fuel cell is activated in cold climates (paragraph 8). The fuel cell includes a pump for adjusting the flow rate of the cooling medium in the cooling medium channel (paragraph 10). Kanno discloses that the cooling water pump is a device for generating the moving force for circulating the cooling water in the cooling water channel and a driving amount can be adjusted according to a drive voltage (paragraph 37). Kanno further discloses that the fuel cell system may have a configuration in which a valve for discharging water is provided at either the inlet or the outlet of the fuel Cell on the cooling water channel. And a portion of the cooling water is discharged to the outside Of the fuel to reduce the amount of the cooling water accumulating in the fuel cell when the cooling water pump is at rest (paragraph 79). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a valve for discharging water out of the fuel cell of Reiser et al. as modified by Kindler et al., because Kanno et al. teach to prevent water from freezing in the fuel cell when the fuel cell is employed in cold climates.

Response to Arguments

5. Applicant's arguments filed on July 29th, 2008 have been fully considered but they are not persuasive.

Applicant's principal arguments are

(a) Reiser et al. in view Kindler et al. do not suggest the claimed fuel cell and method of operating a fuel cell because Reiser et al. and Kindler et al., whether taken alone or in combination, do not suggest a pure water channel configured to allow flow of pure water and permit the pure water to pass into the separator, the pure water channel including polymers respectively having polymer chains, one end of the polymer chains being connected to an inner surface of the pure water channel and capable of forming an entanglement among themselves, as required by claims 1 and 8; and permitting water to flow through a pure water channel having a polymeric material contained therein and pass into the separator when operating the cell and holding the water in the polymeric material when the cell is not operating, as required by claim 10.

(b) The cited references fail to teach or suggest a hollow structure pure water channel configured to allow flow of pure water and permit the pure water to pass into the separator, the pure water channel including polymers respectively having polymer chains, one end of the polymer chains being connected to a surface of the pure water channel and capable of forming an entanglement among themselves. The biplates of

the fuel cells disclosed by Kindler et al. are plate-like structures, not hollow structures. Further, Kindler et al. teach that the biplate is a two-sided separator. Thus, the biplate is not a distinct body from the separator, as required by the present claims. Furthermore, Reiser et al. and Kindler et al. do not suggest a connection of polymer chains capable of forming an entanglement among themselves to an inner surface thereof. There is insufficient suggestion in the references to combine them in the manner suggested by the Examiner. Kindler et al. teach treating the surface of the flow field element, where the fuel passes, with a hydrophilic polymer treatment (column 16, line 22 et seq.) to prevent water accumulation in the fuel passage. In the present invention, on the other hand, the hydrophilic polymer is connected to the inner surface of the pure water channel, not the fuel passage. Because the pure water channel is supposed to transport water there is no motivation to treat it with the hydrophilic polymer to prevent water accumulation.

(c) Kanno et al. do not cure the deficiencies of Reiser et al. and Kindler et al., as Kanno et al. do not suggest a pure water channel configured to allow flow of pure water and permit the pure water to pass into the separator, the pure water channel including polymers respectively having polymer chains, one end of the polymer chains being connected to an inner surface of the pure water channel and capable of forming an entanglement among themselves. There is no suggestion in Reiser et al., Kindler et al., or Kanno et al. to modify the fuel cell and method of Reiser et al. so that they include a pure water channel configured to allow flow of pure water and permit the pure

water to pass into the separator, the pure water channel including polymers respectively having polymer chains, one end of the polymer chains being connected to an inner surface of the pure water channel and capable of forming an entanglement among themselves, as required by claims 1 and 8; and permitting water to flow through a pure water channel having a polymeric material contained therein and pass into the separator when operating the cell and holding the water in the polymeric material when the cell is not operating, as required by claim 10, nor does common sense dictate such modifications. The Examiner has not provided any evidence that there would be any obvious benefit in making such modifications to Reiser et al. See KSR Int'l Co. v. Teleflex, Inc., 500 U.S. __ (No. 04-1350, April 30, 2007) at 20.

The only teaching of a fuel cell including a pure water channel configured to allow flow of pure water and permit the pure water to pass into the separator, the pure water channel including polymers respectively having polymer chains, one end of the polymer chains being connected to an inner surface of the pure water channel and capable of forming an entanglement among themselves, and a method permitting water to flow through the channel and pass into the separator when operating the cell and holding the water in the polymeric material when the cell is not operating, is found in Applicant's disclosure. However, the teaching or suggestion to make a claimed combination and the reasonable expectation of success must not be based on Applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

In response to Applicant's arguments, please consider the following comments.

(a) Reiser et al. teach a fuel cell system comprising a cathode (74), an anode (72) and a polymer electrolyte membrane (70), a fuel gas passage (94), an air passage (92), a separator (84), and a pure water channel (96), which allows the pure water to pass into the separator. Furthermore, Reiser et al. teach the needs to make the separators (water transport plates, 84,86,88,89) become hydrophilic. See Paragraphs 23,27, Figure 1. However, Reiser et al. do not teach the pure water channel including polymers respectively having polymer chains.

Kindler et al. teach a fuel cell where each membrane electrode assembly is sandwiched between a pair of flow-modifying plates which comprise biplates and endplates respectively (column 14, lines 5.9-61). Kindler et al. disclose that each biplate is a two-sided separator that prevents contact between the anode and the cathode of the fuel cell. Kindler et al. further disclose that the biplates of the fuel cells are provided with a hydrophilic surface (column 16, lines 35-37); an example of a hydrophilic material that can be applied to the surface of the biplate is N-isopropyl acrylamide (column 16, lines 43-53). By attaching a polymer as the hydrophilic material to the surface of the water channels on the biplates, the fuel cell inherently has a structure wherein polymer chains that form an entanglement among themselves since N-isopropyl acrylamide is the same hydrophobic polymer used by the applicant in the instant invention. Kindler et al. teach the hydrophilic treatment have the desirable property of discouraging droplet formation, and allowing the formation of a sheet of water which is more easily drained by gravity. See Column 16, Lines 32-42. Therefore, it would have been obvious to one of ordinary skill in the art to include polymers having a polymer chains on the surface of

water channels of Reiser et al., because Kindler et al. teach the use of hydrophilic treatment to facilitate the flow of the water.

(b) Reiser et al. teach a fuel cell system comprising a cathode (74), an anode (72) and a polymer electrolyte membrane (70), a fuel gas passage (94), an air passage (92), a separator (84), and a pure water channel (96), which allows the pure water to pass into the separator.

(c) In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and In re Jones, 958 .2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include polymers having a polymer chains on the surface of water channels of Reiser et al., because Kindler et al. teach the use of hydrophilic treatment to facilitate the flow of the water.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ben Lewis whose telephone number is 571-272-6481. The examiner can normally be reached on 8:30am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ben Lewis/
Examiner, Art Unit 1795

/PATRICK RYAN/
Supervisory Patent Examiner, Art Unit 1795